

# Lean Project Delivery

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**What has changed Manufacturing, and sharply pushed up productivity, are new concepts. Information and automation are less important than new theories of manufacturing, which are an advance comparable to the arrival of mass production 80 years ago. Indeed, some of these theories, such as Toyota's "lean manufacturing", do away with robots, computers and automation.**

Peter Drucker, "The Economist", pg 12, November 3, 2001.

# Results in words

- Workers hourly salaries are going up
- Job satisfaction is improved
  - Participation -> Motivation
  - Higher degree of self justice
- Less claims
- Shorter construction time
- Less errors and omissions
- Lower construction costs
- Improved competitive capacity

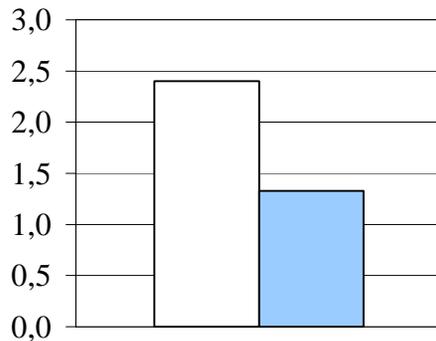
# Results in numbers

5 test projects (PPB-programme):

- Reduced construction time by up to 20%
- Reduced construction costs by up to 10%
- Up to 35% higher hourly salaries
- 0-errors on several projects

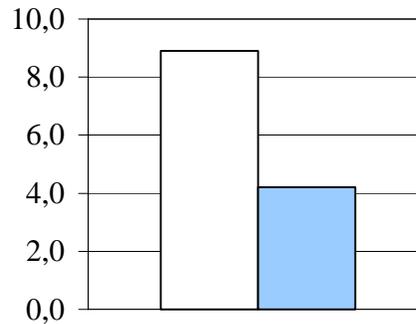
# Waste reduction in a design office

**PRODUCT UNIT ERRORS**



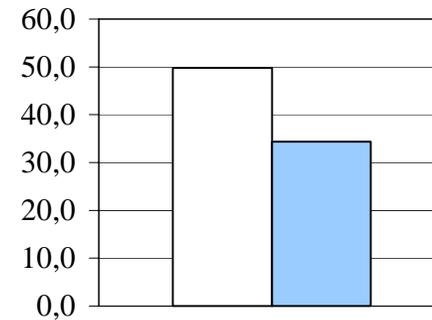
**44% Decrease**

**% OF WAITING TIME IN PROCESS**



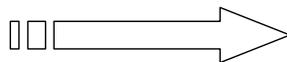
**53% Reduction**

**% NON VALUE ADDING ACTIVITIES**



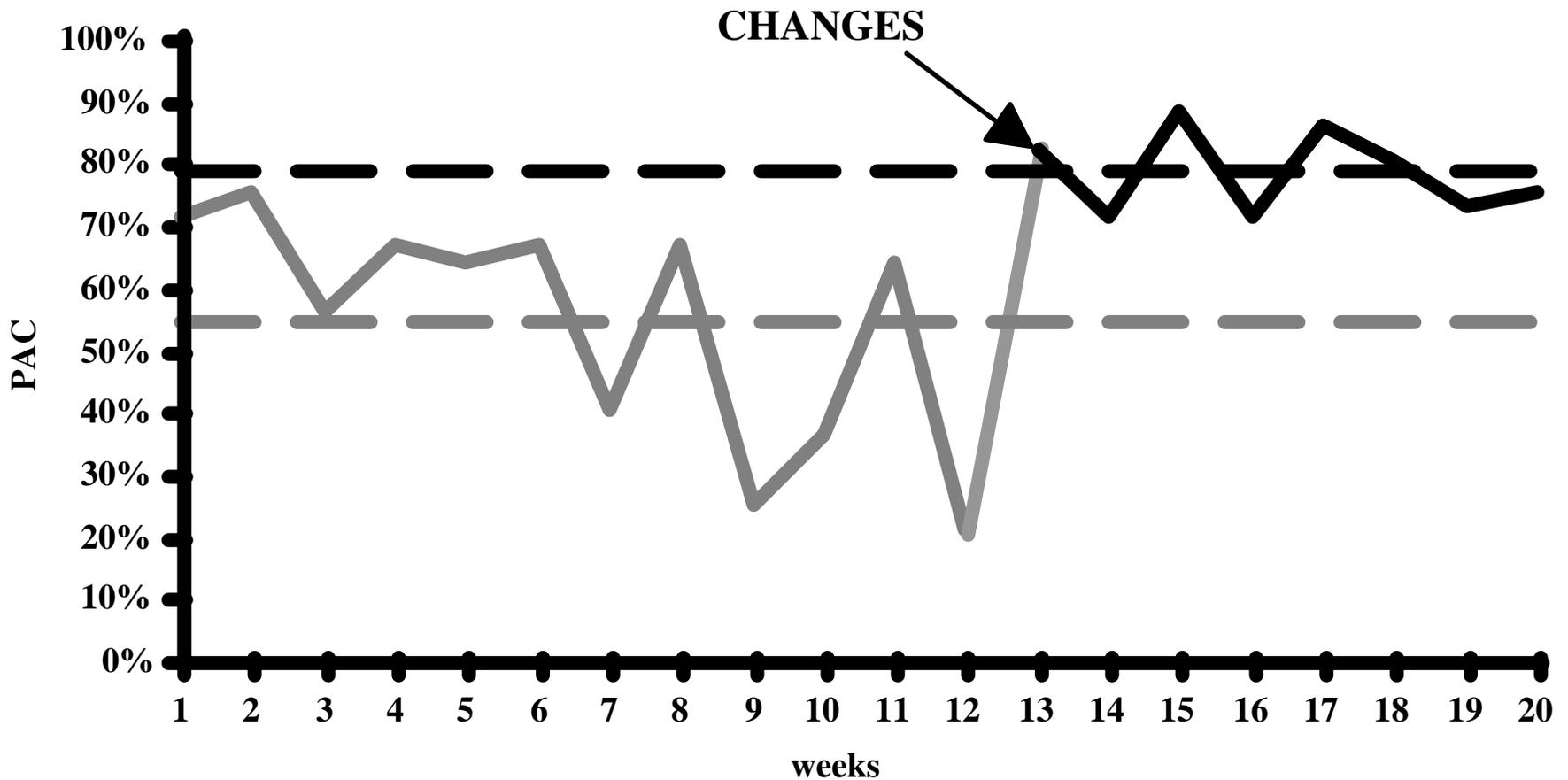
**31% Decrease**

□ *Before*      ■ *After*

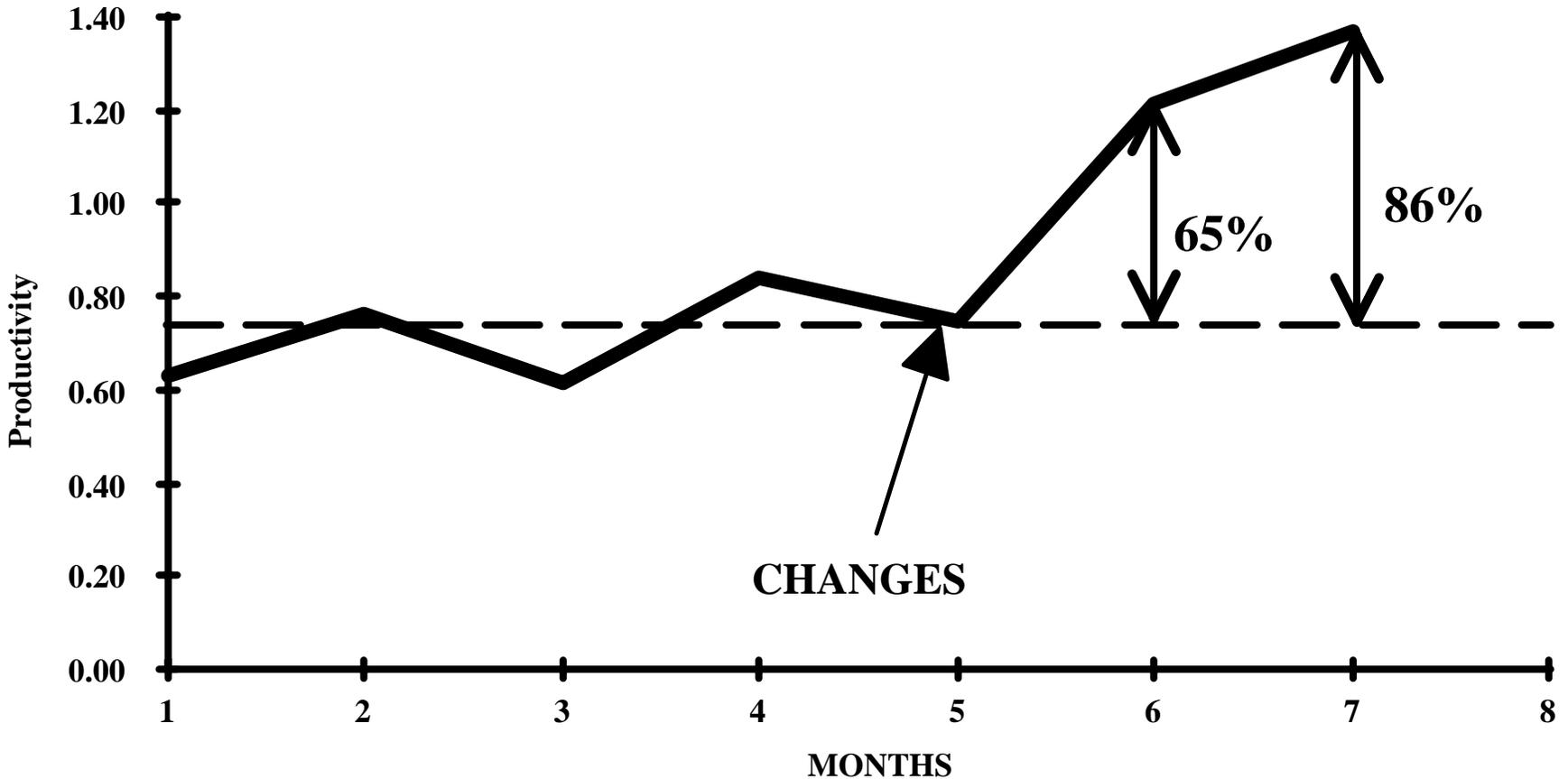


**PRODUCTIVITY INCREASE OF 31%**

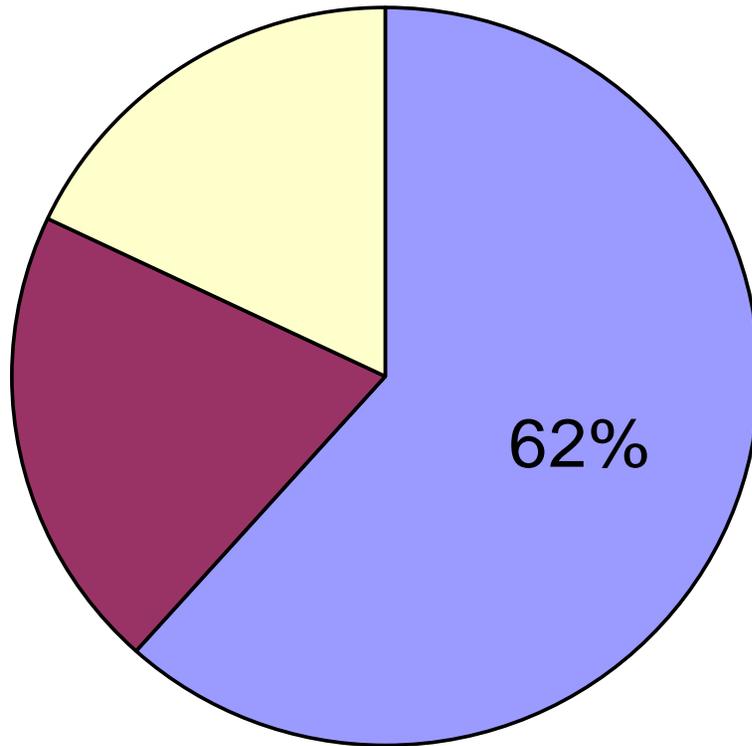
# Evolution of PPC



# Productivity Evolution

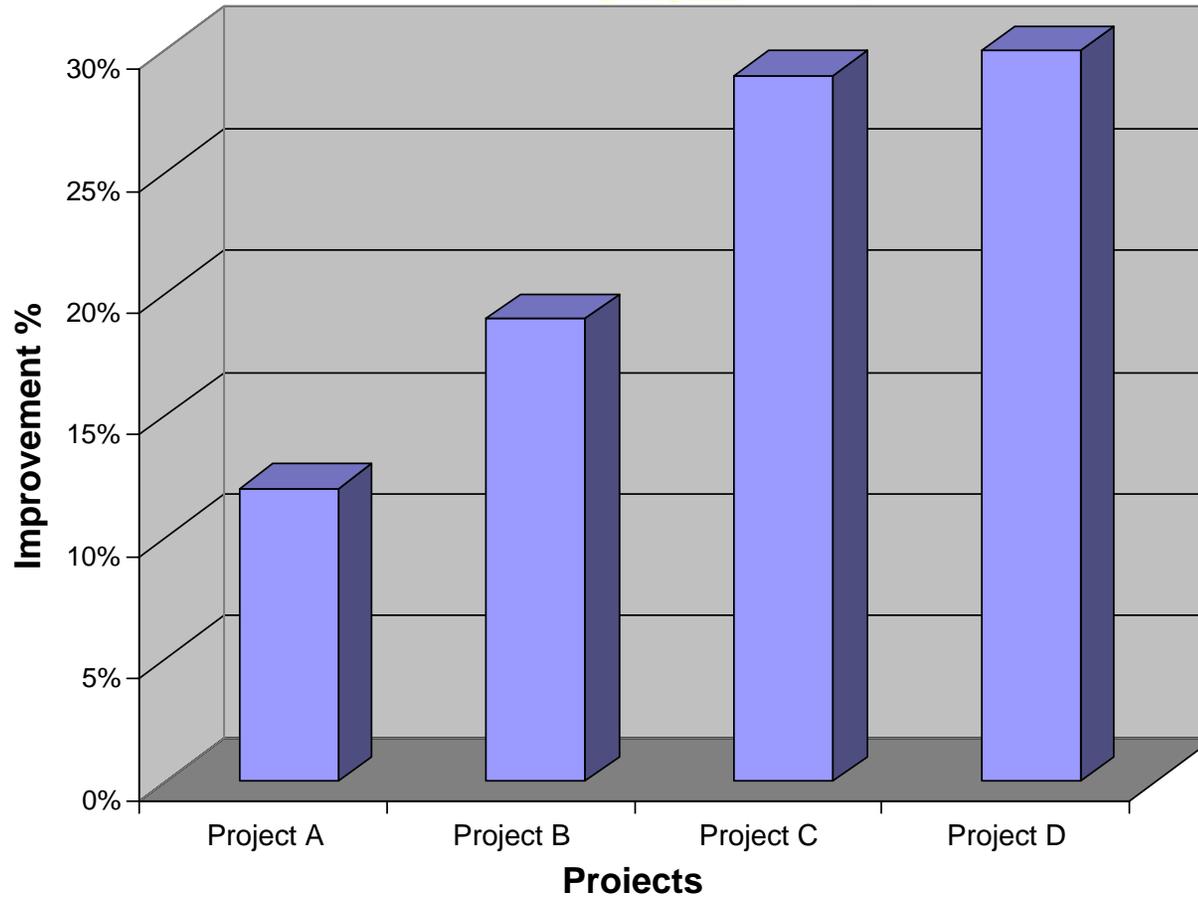


# Causes of no Completion



- Internal Causes
- External Causes
- Others

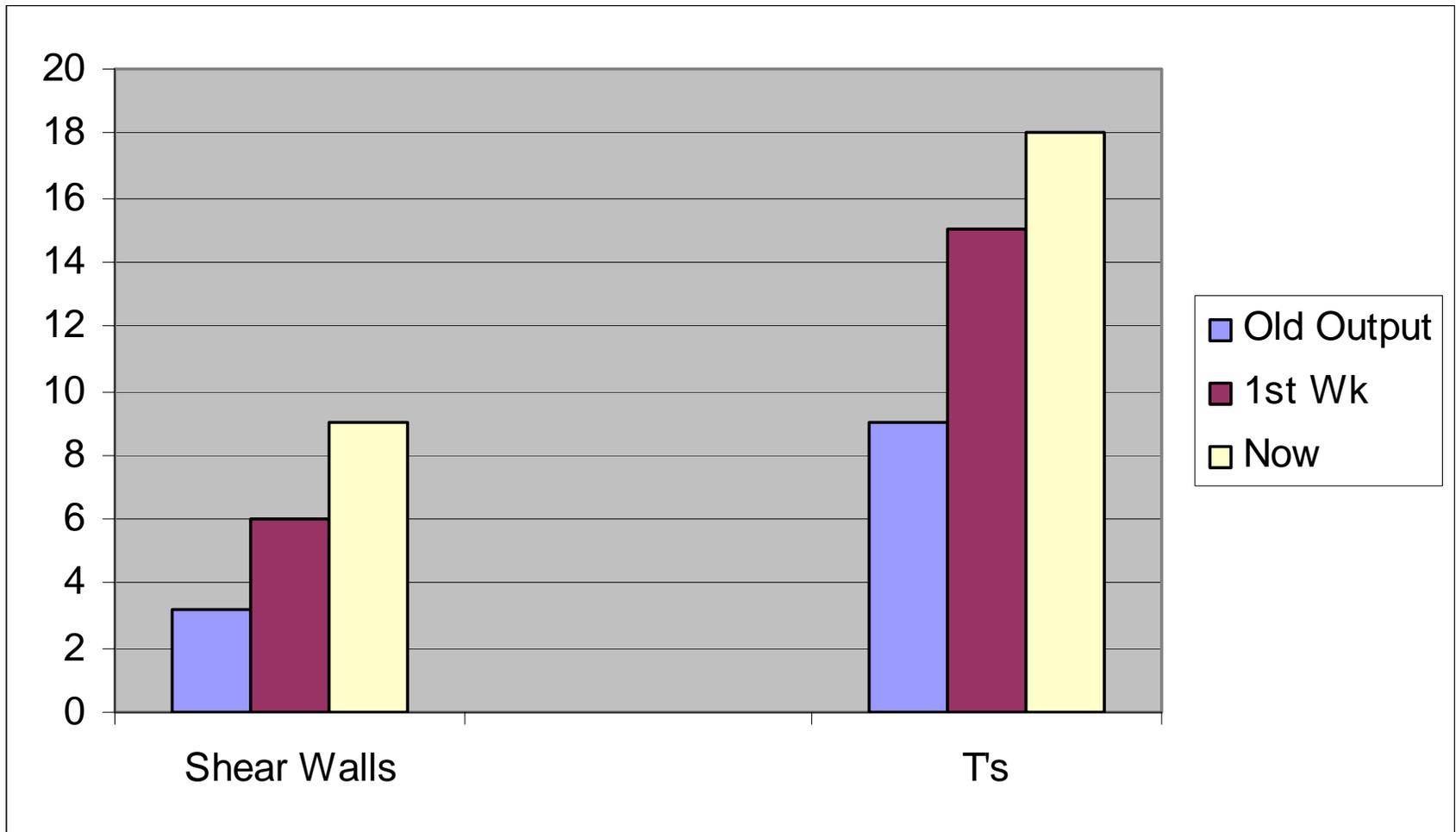
# Productivity Improvement Results



# The results show that we are on the right path...



# Improvement in Throughput & Productivity



# Who else is exploring application?

Owners: Intel, Ford, Solutia, Rice University, BAA

Designers: IDC, Neenan, Burt Hill Kosar Rittelmann,

Constructors: Boldt, Kinetics, Southland Industries, EMCOR, Neenan, Linbeck, DPR, EMCOR, Fluor/Ames/Kramer, Walbridge Aldinger, GyM, Westbrook AC, Simpson Mechanical

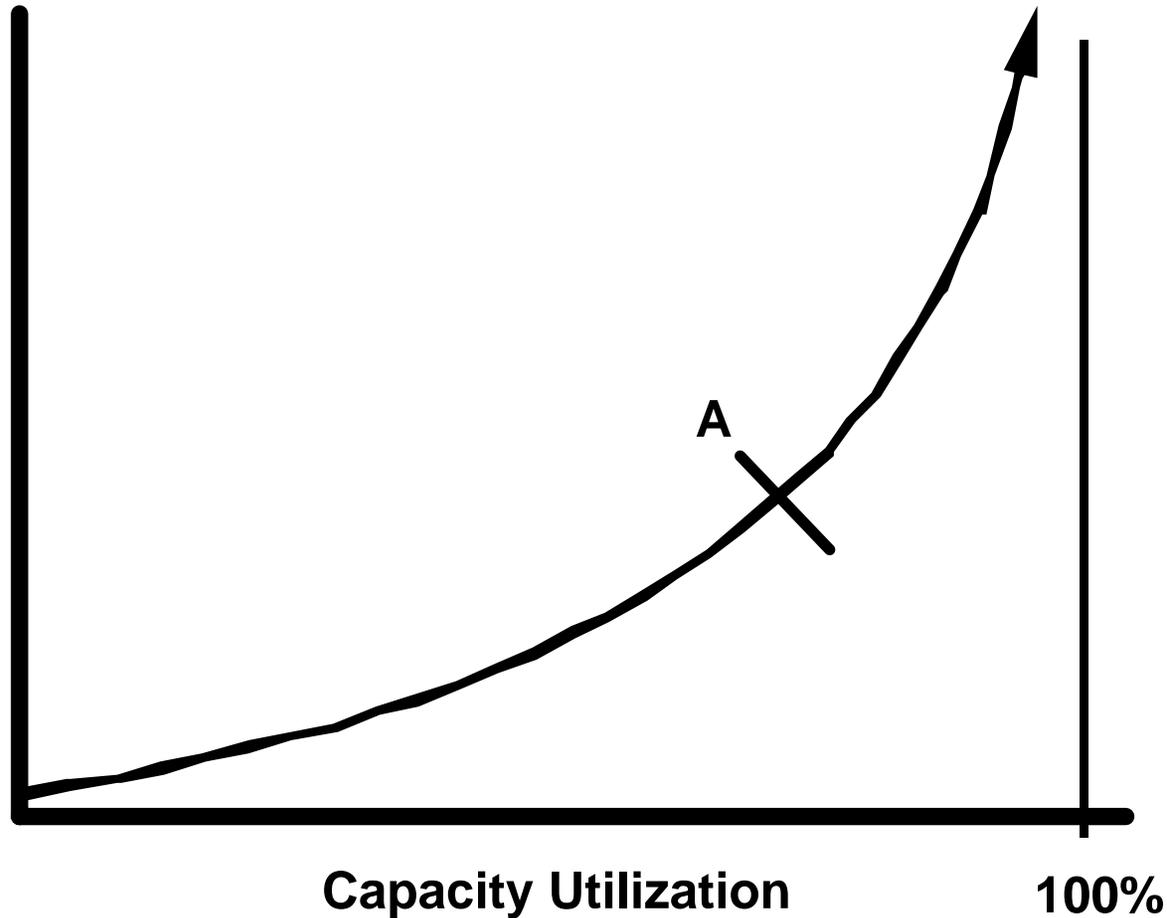
# What is this thing called “LEAN”?

- Not mass, not craft. A third form of production system design.
- The Lean Ideal
  - Meet requirements of a unique customer
  - Deliver it instantly
  - Maintain no inventory
- “Give customers what they want, deliver it instantly, with no waste.”

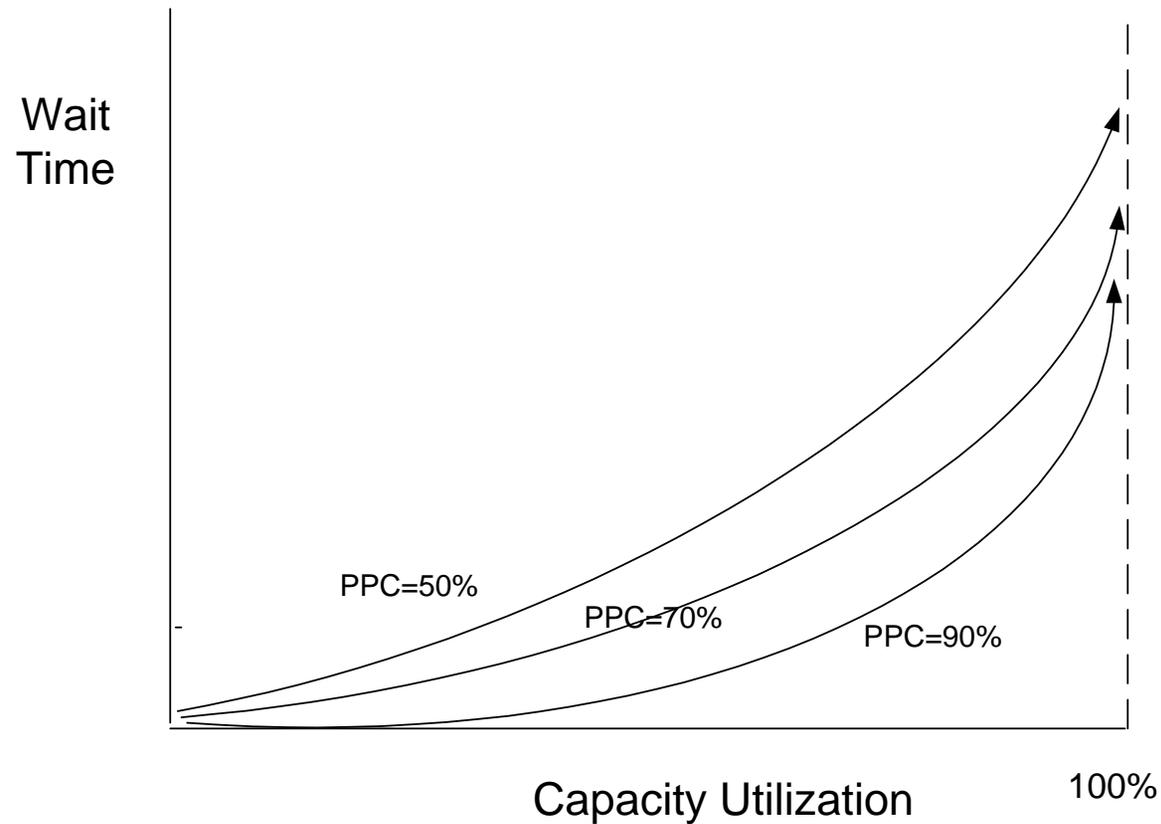
# How do we manage projects now?

- **Determine client requirements and design to meet them. Align design to quality, schedule and budget limits.**
- **Manage the project by breaking it into pieces, estimating duration and resource requirements for each piece, then put the pieces in a logical order with CPM.**
- **Assign or contract for each piece, give start notice and monitor each piece to assure it meets safety, quality, schedule and cost standards. Take action on negative variance from standards.**
- **Coordinate using the master schedule and weekly meetings.**
- **Cost may reduced by productivity improvement. Duration by speeding each piece or changing logic. Quality and safety get better with inspection and enforcement.**

# More Physics: Variability, Lead Time, & Capacity Utilization



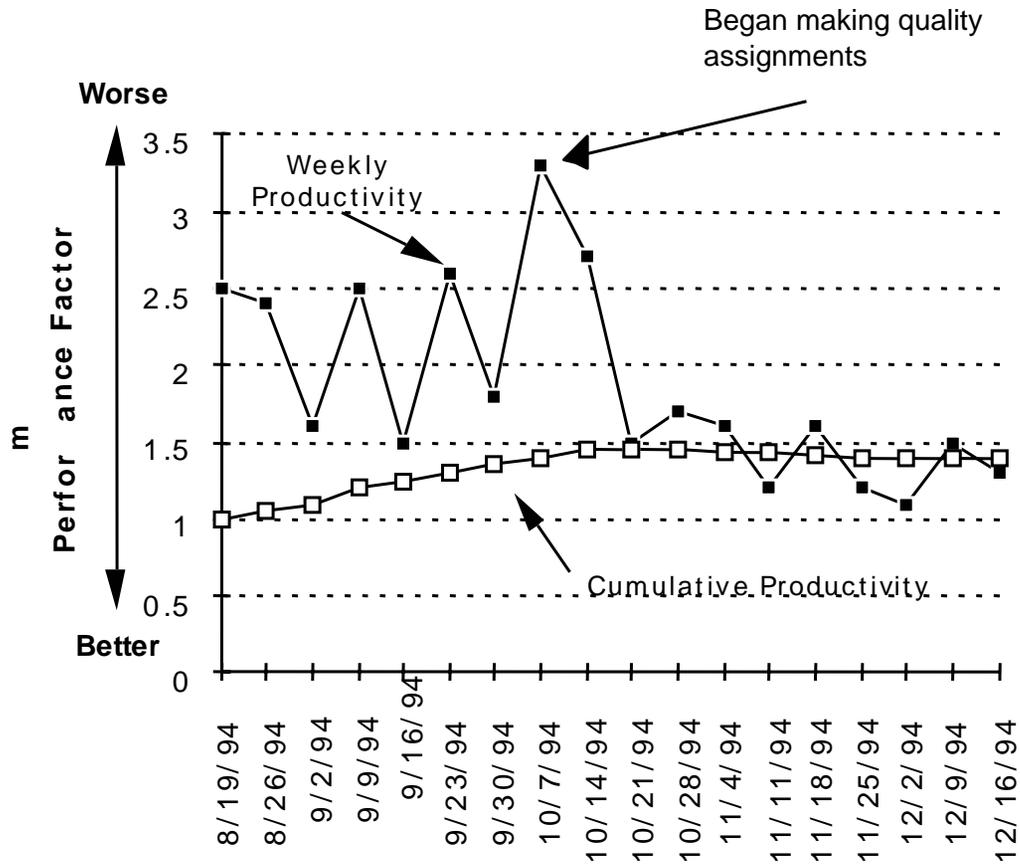
# The Impact of Variability



# Key Points

- Reducing workflow variability
  - Improves total system performance,
  - Makes project outcomes more predictable,
  - Simplifies coordination,
  - Reveals new opportunities for improvement.
- Point speed and productivity don't matter – throughput does.
- Strategy: Reduce variation then go for speed to increase throughput.

# The Impact of Last Planner



# Weekly Plan & PPC



Project: Same Day Sugery  
Planner: Dena Deibert

**Week of 10/16/00**

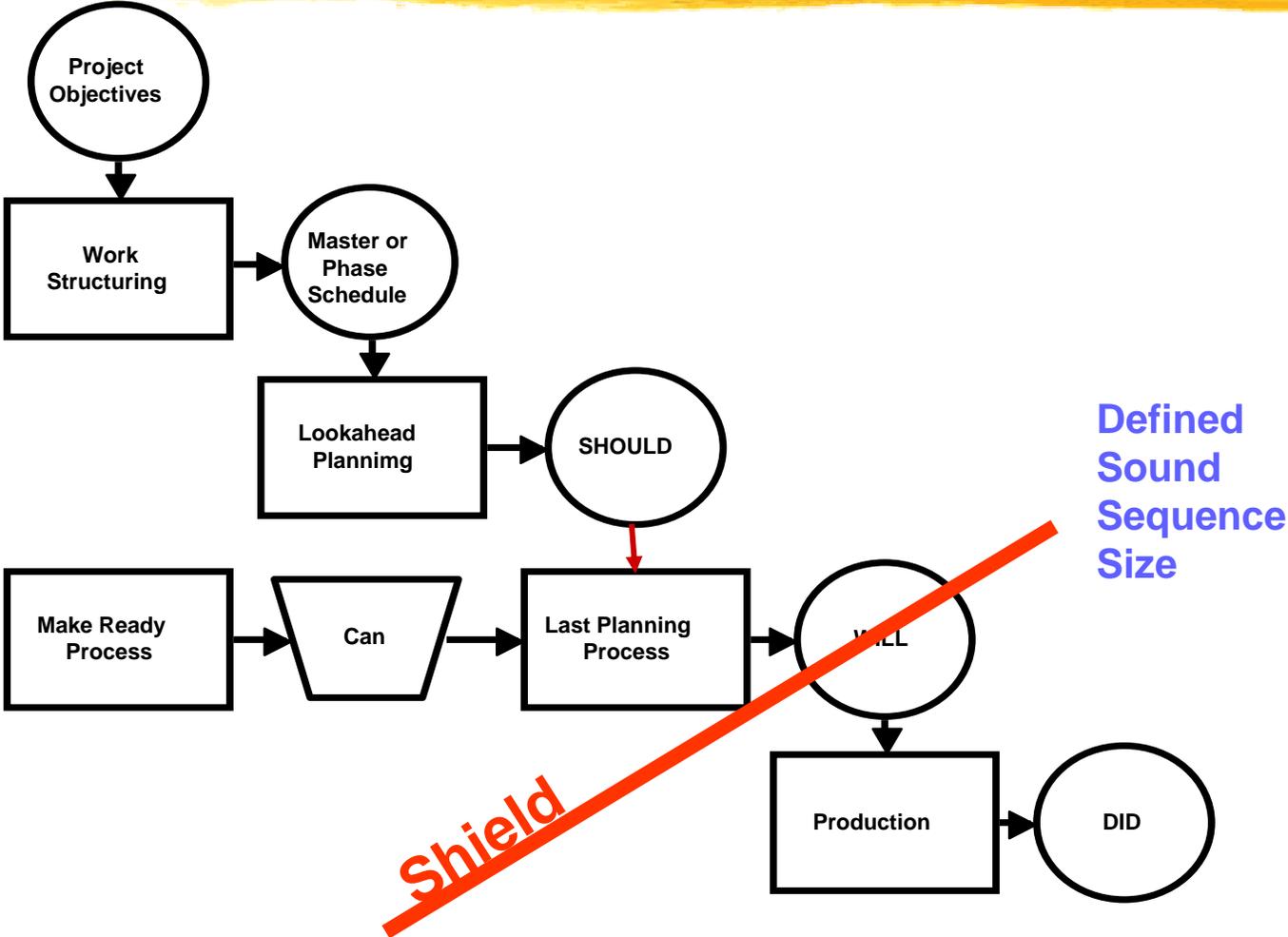
**PPC = 69%**

Repeat	Assignment Description	Responsible Party								Done?		PPC Analysis
			M	T	W	T	F	S	Y	N	Reasons For Variance / Comments	
	<b>Remember the Five Criteria for Release of Assignments Defined - Sound - Proper Sequence - Right Size - Able to Learn</b>											
	<b>Review mock-up drywall dimensions</b>	Randy	x	x						Y		<b>Wardrobe dimensions changed</b>
	<b>Review microscope vibration Study</b>	David	x	x	x	x	x				N	
	<b>Review bids - Bid Pack 3</b>	Dena/ Brad		x	x	x	x			Y		<b>Will award next week.</b>
	<b>Review roofing shops</b>	Jose'	x	x	x	x	x			Y		<b>Week 1 of 2</b>
	<b>Complete concrete haunches</b>	Randy			x					Y		
	<b>Releae order on limestone</b>	Dena	x							Y		
	<b>Re-submit curtainwall support shops</b>	Dick	x	x	x	x	x				N	<b>Waiting for curtainwall shop drwg.</b>
	<b>Roof framing: 75% complete</b>	Bob Brue	x	x	x	x	x			Y		
	<b>Submit Phase 2 Millwork Shops</b>	Precision	x	x	x	x					N	
	<b>Fabricate mock-up millwork</b>	Precision	x	x	x	x	x			Y		<b>Week 2 of 3</b>
	<b>Re-submit curtainwall shops &amp; structural calcs</b>	Jim Leicht	x	x	x						N	<b>Middle of next week</b>
	<b>Finalize review of louver shops</b>	Tony/ David	x	x	x	x				Y		
	<b>Review GL-1 and GL-2</b>	ARC/Jim Leight	x	x	x					Y		

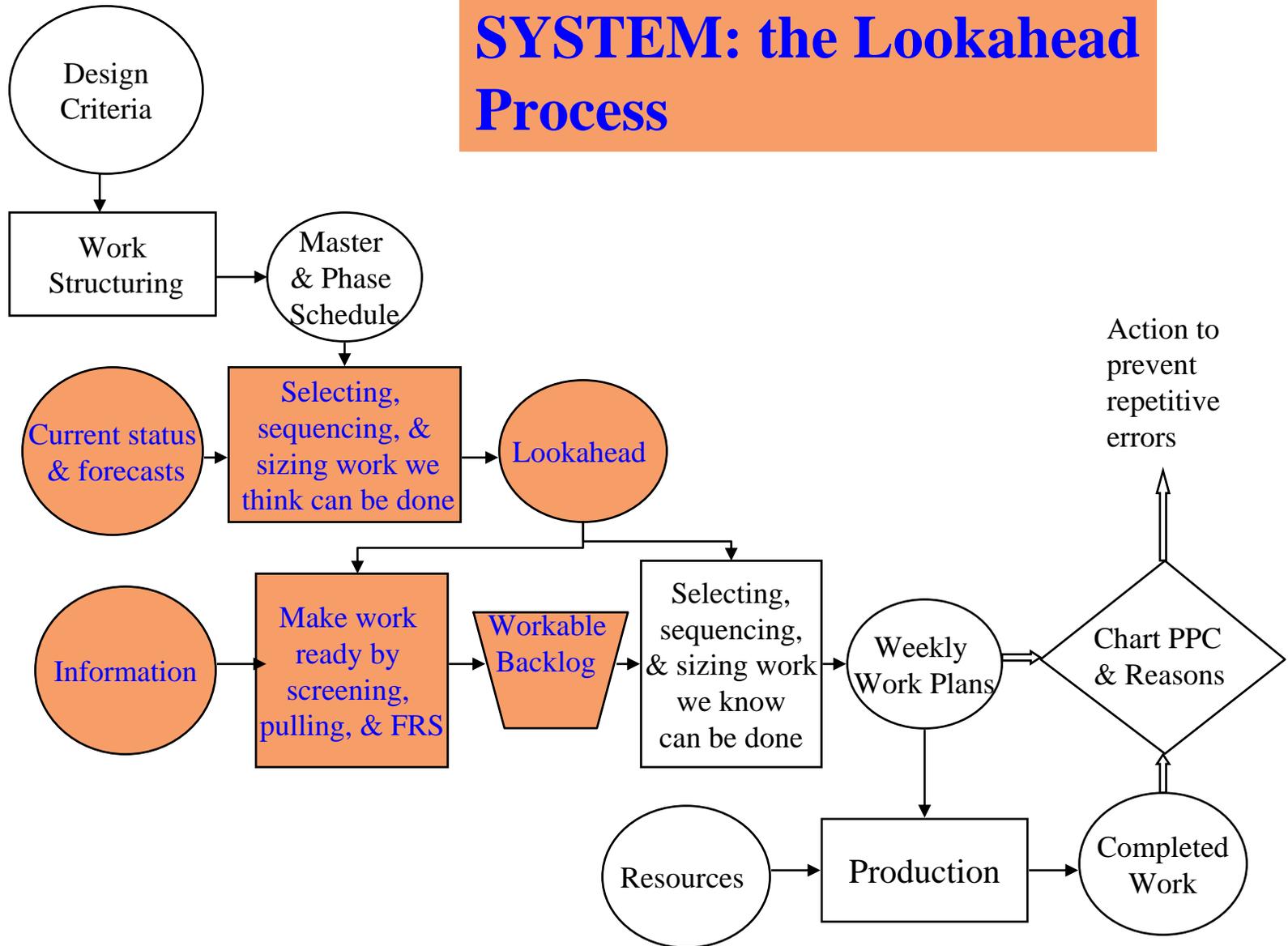
# Uncertainty and Variability Can Be Managed

- Reduce variability then go for speed.
- The place to start is by shielding production from flow variability by making only 'quality' assignments.
- Managing the remaining variability involves thoughtful location and sizing of inventory and capacity buffers.
- Every 'workstation' must make work ready in the right sequence and rate for reliable release to their 'customer'

# The Place To Start



# LAST PLANNER SYSTEM: the Lookahead Process





# Purposes of the Lookahead Process

- Shape work flow sequence and rate
- Match work flow and capacity
- Maintain a backlog of ready work
- Develop detailed plans for how work is to be done
  - Safety, environmental, quality issues

# Purposes of Master Schedules

- Demonstrate the feasibility of completing the work within the available time.
- Develop and display execution strategies.
- Determine when long lead items will be needed.
- Identify milestones important to client or stakeholders.

# Phase Scheduling: Purposes and Actions

- Produce the best possible plan by involving all with relevant expertise and by planning near action.
- Assure that everyone in a phase understands and supports the plan by developing the schedule as a team.
- Assure the selection of value adding tasks that release other work by working backwards from the target completion date to produce a pull schedule.
- Publicly determine the amount of time available for 'contingency' and decide as a group how to spend it.

QuickTime™ and a  
Photo - JPEG decompressor  
are needed to see this picture.

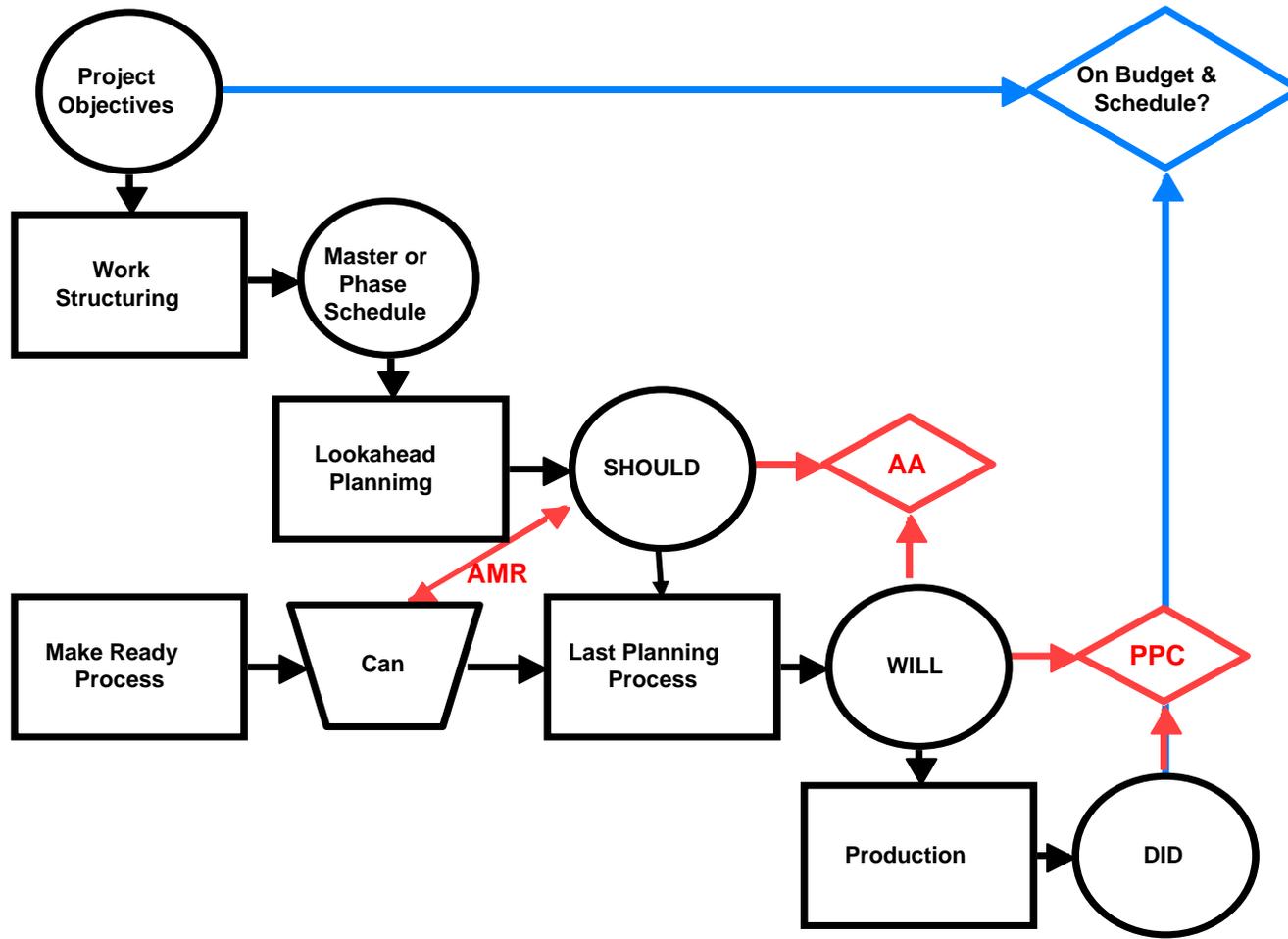
# Entry Rules

- Rule 1: Allow activities to remain in the Master/Phase schedule unless positive knowledge exists that it should not or cannot be executed when scheduled.
- Rule 2: Allow activities to remain in the lookahead window only if the planner is confident that it can be made ready for execution when scheduled. (Screening)
- Rule 3: Allow activities into weekly work plans only if all constraints have been removed. (Shielding)

# Summary Recommendations for Production Control

- **Limit master schedules to milestones and long lead items.**
- **Produce phase schedules with the team that will do the work, using a backward pass, and making float explicit.**
- **Drop activities from the phase schedule into a 6 week lookahead, screen for constraints, and advance only if constraints can be removed in time.**
- **Try to make only quality assignments. Allow assignments to be rejected.**
- **Track PPC and act on reasons for plan failure.**

# Project and Production Controls



# Project Coordination & Control

**Project coordination and control in the *Last Planner System* is principally the practice of eliciting reliable promises and declarations of completion of those activities that release work to others. This allows the project work to stay in the desired sequence and advance as quickly as possible.**

Hal Macomber, Good2Great

# Reliable Promises

- 1. I am competent to perform or do I have access to competence?**
- 2. I estimate it will take some amount of time (hands-on)**
- 3. I have the capacity & I'll allocate it.**
- 4. I am not having a private unspoken conversation in conflict with promise.**
- 5. I will be responsible.**

*Commitment Processes are Conversation Acts*

# Current Practice vs Lean

	<b>Current</b>	<b>Lean</b>
<b>Planning</b>	<b>Knowing</b>	<b>Learning</b>
<b>Uncertainty</b>	<b>External</b>	<b>Internal</b>
<b>Control</b>	<b>Tracking</b>	<b>Steering</b>
<b>Coordination</b>	<b>Following Orders</b>	<b>Keeping a promise</b>
<b>The Goal of Supervision</b>	<b>Point Speed &amp; Productivity</b>	<b>Reduce Variation &amp; Manage Flow</b>
<b>Commercial Contracts</b>	<b>Trade Production System Efficiency for Apparent Security</b>	<b>Aligns Production System Objectives with Interests</b>